CLAIMS

1. A rejuvenated tantalum sputtering target comprising:

a used tantalum sputtering target having a tantalum sputtering plate and a backing plate, wherein a target face of said tantalum sputtering plate includes one or more consumed surface area portions; and

a mass of bonded metal particles within each of said one or more consumed surface area portions, wherein said mass of bonded metal particles partially or completely fills each of said one or more consumed surface area portions,

whereby said used tantalum sputtering target is rejuvenated without separating said backing plate from said tantalum sputtering plate.

2. The rejuvenated tantalum sputtering target as defined in claim 1, wherein said mass of bonded metal particles has microstructure substantially similar to said tantalum sputtering plate.

3. A method to rejuvenate a consumed tantalum sputtering target comprising the steps:

providing a used tantalum sputtering target having a tantalum sputtering plate and a backing plate, wherein a target face of said tantalum sputtering plate includes one or more consumed surface area portions;

providing a powder of refractory metal having microstructure substantially similar to the tantalum sputtering plate;

filling each of one or more consumed surface area portions with said powder of refractory metal to form filled portions; and

applying a short term, high ~~powered radiant~~ energy beam locally to said filled portions to bond powder particles of said powder of refractory metal to each other and to said each of one or more consumed surface area portions to form a mass of bonded metal particles,

whereby said used tantalum sputtering target is rejuvenated without separating said backing plate from said tantalum sputtering plate.

4. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 3 further comprising the step removing excess of said mass of bonded metal particles to level said tantalum sputtering plate.

5. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 3 wherein said energy beam is laser beam.

6. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 3 wherein said energy beam is electron beam.

7. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 3 wherein the bonding step is plasma deposition.

8. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 3 wherein said energy beam is applied in a vacuum environment.

9. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 3 wherein said energy beam is applied in an inert gas environment.

10. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 3 wherein said powder of refractory metal is in the form of a powder-derived foil, wherein said powder-derived foil is laid individually in said each of one or more consumed surface area portions and bonded to the sputter plate, whereby said filling and bonding steps are repeated until said consumed surface area portions are partially or completely filled.

11. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 4 wherein the step removing excess of said mass of bonded metal particles to level the sputter plate is machining.

12. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 4 wherein the step removing excess of said mass of bonded metal particles to level the sputter plate is sanding.

13. The method of rejuvenating a consumed tantalum sputtering target as defined in claim 4 wherein the step removing excess of said mass of bonded metal particles to level the sputter plate is abrasion etching.

14. The method of rejuvenating a consumed sputtering target as defined in claim 4 wherein the step removing excess of said mass of bonded metal particles to level the sputter plate is burn-in sputtering.

15. A rejuvenated sputtering target having a mass of bonded metal particles filling each of one or more consumed surface area portions of a used sputtering target with the particles

bonded to each other and to the surface area(s), as produced in accordance with the method of claim 3.

16. A process for rejuvenating a refractory metal sputtering target having one or more consumed surface area portions comprising the steps of:

filling each of one or more consumed surface area portions with powder metal, the powder metal being of the same composition as the refractory metal sputtering target to form filled portions;

applying a short term, high powered radiant energy beam in vacuum or inert gas atmosphere locally to the filled portions to bond powder particles of the powder of refractory metal to each other and to each of one or more consumed surface area portions; and

leveling of the sputtering target to remove high points of the bond powder particles.

17. The process of claim 16 wherein the sputtering target is selected from the group consisting of tantalum and niobium and their alloys.

18. The process of claim 16 wherein the energy beam is selected from the group consisting of laser beam and electron beam.

19. The process of claim 16 wherein the leveling step is selected from the group consisting of machining, sanding, abrasion etching and burn-in sputtering.

20. A rejuvenated sputtering target having a fully dense coating filling each of one or more consumed surface area portions of a used sputtering target with the fully dense

coating bonded to the surface area(s) in accordance with the method of claim 16.

21. A method to rejuvenate a refractory metal product having one or more locally consumed surface area portions comprising the steps of:

selectively supplying a powder of refractory metal to partially or completely fill each of said one or more consumed surface area portions of the refractory metal product to form filled portions; and

applying a short term, high powered radiant energy beam locally to said filled portions to bond powder particles of said powder of refractory metal to each other and to each of said one or more consumed surface area portions.

22. The method of claim 21 as applied to a laminate of refractory metal to non-refractory metal.

23. The method of claim 21 wherein the radiant energy beam is a laser beam.

24. The method of claim 21 wherein the radiant energy beam is an electron beam.